Payal Mohapatra

Curriculum Vitae

PhD candidate, Computer Engineering
Northwestern University, Illinois 60202
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My Webpage
Github *Linkedin*

Education

2021–12/2025 (*Expected*) **PhD, Computer Engineering**, *Northwestern University*, Illinois, USA.
Empowering Real-World Sensing: Algorithms for Imperfect Time-Series
Advisor : Dr. Qi Zhu
CGPA : 3.96/4

2015–2017 : **Masters (*by research*), Electrical Engineering**, *Indian Institute of Technology Madras*, India.
CGPA : 9.31/10

2011–2015 : **Bachelor of Engineering, Electronics & Instrumentation**, *Madras Institute of Technology, Anna University*, India.
CGPA : 9.36/10

Skills

Deep Learning : Sequence Modeling (time-series and audio), Self-Supervised Learning, Large Language Models, Real-time Inference, On-device deployment

Programming Languages : Python, C++, Shell, Perl, LaTeX, Verilog, System Verilog, Universal Verification Methodology(UVM)

Technologies : Pytorch, Tensorflow, Sklearn, Pandas, Seaborn, Librosa, SpecAugment, Signal, Soundfile, PyAudio, Transformer

Tools : LabVIEW, Matlab, Spice Simulation & PCB Design, Xilinx Vivado, Khadas VIM3, Jetson TX2

Publications

In Conference Proceedings

2024 Payal Mohapatra, Lixu Wang, and Qi Zhu. Phase-driven domain generalizable learning for non-stationary time series. *Under submission to International Conference on Learning Representations*, 2024.

2024 Payal Mohapatra, Shamika Likhite, Subrata Biswas, Bashima Islam, and Qi Zhu. Missingness-resilient video-enhanced multimodal disfluency detection. In *Interspeech 2024*, pages 5093–5097, 2024.

2023 Payal Mohapatra, Akash Pandey, Yueyuan Sui, and Qi Zhu. Effect of attention and self-supervised speech embeddings on non-semantic speech tasks. In *Proceedings of the 31st ACM International Conference on Multimedia*, MM '23, 2023.

2023 Payal Mohapatra, Akash Pandey, Sinan Keten, Wei Chen, and Qi Zhu. Person identification with wearable sensing using missing feature encoding and multi-stage modality fusion. In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2023.

2023 Payal Mohapatra, Bashima Islam, Md Tamzeed Islam, Ruochen Jiao, and Qi Zhu. Efficient stuttering event detection using siamese networks. In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2023.

2022 Payal Mohapatra, Akash Pandey, Bashima Islam, and Qi Zhu. Speech disfluency detection with contextual representation and data distillation. In *Proceedings of the 1st ACM International Workshop on Intelligent Acoustic Systems and Applications*, 2022.

2017 Payal Mohapatra, SP Preejith, and Mohanasankar Sivaprakasam. A novel sensor for wrist based optical heart rate monitor. In *2017 IEEE international instrumentation and measurement technology conference (I2MTC)*. IEEE, 2017.

Journal Articles

2024 Payal Mohapatra, Vasudev Aravind, Marisa Bisram, Young-Joong Lee, Hyoyoung Jeong, Katherine Jinkins, Richard Gardner, Jill Streamer, Brent Bowers, Lora Cavuoto, Anthony Banks, Shuai Xu, John Rogers, Jian Cao, Qi Zhu, and Ping Guo. Wearable network for multilevel physical fatigue prediction in manufacturing workers. *PNAS Nexus*, volume 3, 2024.

2018 Payal Mohapatra, Preejith Sreeletha Premkumar, and Mohanasankar Sivaprakasam. A yellow–orange wavelength-based short-term heart rate variability measurement scheme for wrist-based wearables. *IEEE Transactions on Instrumentation and Measurement*. IEEE, 2018.

Preprint Articles

2024 Payal Mohapatra, Ali Aroudi, Anurag Kumar, and Morteza Khaleghimeybodi. Non-verbal hands-free control for smart glasses using teeth clicks. *arXiv preprint arXiv:2408.11346*, 2024.

Research Experience

Meta Reality Labs, Research Scientist Intern

June, 2024 – Oct, 2024 ***Head-tracked Conversation Partners' Localization using IMUs on Smart-Glasses***.
Designed an algorithm to extract conversation-focused features from head-orientation data, quantifying the number and location of speakers in a seated conversation.

Collaborators: Dr. Morteza Khaleghimeybodi, Dr. Ali Aroudi, Dr.Calvin Murdock, Dr.Buye Xu, Dr.Anjali Menon

Meta Reality Labs, Research Scientist Intern | Part-time student researcher

June, 2023 – Dec 2023 ***Non-Verbal Discreet Communication Technology for Smart Glasses***.
Kicked off a first-of-its-kind system for Audio Event Detection (AED) on AR glasses. Developed algorithms for AED using highly sensitive accelerometers. Deployed a lightweight application-specific convolutional inference engine in real-time and demonstrated a fully functional prototype at the Meta internal symposium.

Collaborators: Dr. Morteza Khaleghimeybodi, Dr. Ali Aroudi, Dr.Anurag Kumar

Northwestern University, PhD Candidate

2024 ***Low-overhead Phase Augmentation for General Time Series Analysis***.
Investigating the role of phase in generating augmented views for time-series while retaining semantic information for various tasks (classification, forecasting, anomaly detection), and designing low/non-parametric strategies for this diversification.

2024 ***Efficient Multi-Modal Disfluency Detection***.
Developed a resilient architecture to support effective audio-visual learning in unreliable data settings for disfluency detection, curated a public multimodal disfluency dataset and presented at Interspeech 2024.

Collaborators: Dr. Bashima Islam (*Worcester Polytechnic Institute*), Dr. Qi Zhu (*Northwestern University*)

2023 ***Addressing Non-Stationarity for Domain-Generalisation in Time Series Applications.***.
Developed a generalizable machine-learning framework by investigating the relationship between non-stationarity and phase in time series. Demonstrated the effectiveness of the method on several time-series classification tasks empirically and theoretically. Manuscript submitted to NeurIPS 2024.

2022 ***Self Supervised Learning Methods to detect Speech Disfluency under Data Constraints***.
Developed a pipeline to use real-world unlabeled disfluency data from multiple domains to learn contextual representations for downstream tasks with a limited labeling budget. Presented preliminary results at the workshop on intelligent acoustics co-located with ACM MobiSys'22 and a proposed small-scale self-supervised pretraining methodology in ICASSP'23.

Collaborators: Dr. Bashima Islam (*Worcester Polytechnic Institute*), Dr. Md Tamzeed Islam (*Amazon Lab126*), Dr. Qi Zhu (*Northwestern University*)

2022-2024 ***Predictive Models for Human Fatigue and safety - Operator 4.0***.
Developed sample-efficient machine learning methods to predict perceived fatigue levels from biophysical and locomotive sensor data collected from user studies at Northwestern University. Handled fine-grained, lossy, noisy, and missing long-range data from wearable sensors. Demonstrated the functional closed-loop prototype on two factory floors with near-real-time data visualization and obtained user feedback. Manuscript under submission to PNAS Nexus.

Collaborators: Northwestern University, John Deere, Boeing, MxD, University of Buffalo

Indian Institute of Technology Madras, Research Assistant

July,2015 – Oct,2017 ***Wrist-based wearable device to measure heart rate under conditions of physical activity and Heart Rate Variability at stationary instants***.
Designed and developed a custom optical sensor board for optimal signal quality in users with varying skin tones. Developed a motion-artifact rejection algorithm based on normalized least-mean-squared adaptive filtering for real-time processing and validated it with an extensive user study.

Collaborators: Preejith SP (*Healthcare Technology Innovation Centre*) ,Dr. Mohanasankar Sivaprakasam (*Indian Institute of Technology Madras*)

Professional Experience

Analog Devices Incorporation

Experience as Design Verification engineer on multiple mixed-signal System on Chips(SoC)

March,2020 – Sept, 2021 ***Design Verification of Fast DSP in an Audio Noise Cancellation ASIC***.
Conducted end-to-end verification and developed reference models for a custom DSP used for biquad operations, audio peripherals like ADCs, DACs & asynchronous sample rate converters

Feb,2019 – Feb, 2020 ***Subsystem Verification of Scalable Ethernet Switch***.
Worked on time sensitive networking protocols and developed reference models for two of the five supported features by the SoC adhering to IEEE 802.1AS (time synchronization) and IEEE 802.1qbv (Scheduled Traffic). Employed verification strategy was selected for presentation at global intra-company conference in 2020. Chip successfully taped out in Feb 2020.

March,2018 – Dec, 2018 ***Block Level Verification of Beamforming Algorithm in Ultrasound Fingerprint Sensing ASIC***.
Developed an error injection mechanism to verify the calibration algorithm of transmitters and receivers in the signal datapath, and implemented a synthetic aperture algorithm for beamforming. Demonstrated a system to detect occurrence of touch on the SoC at a company-wide workshop. Chip successfully taped out in Dec 2018.

Nov,2017 – March, 2018 ***Formal Digital Design verification***.
Developed mathematical theorems to describe system behavior without explicit modeling to prove/disprove properties with all possible stimuli using EDA tools.

Teaching Assistantship

Winter, 2017: **EE5400: Analog and Digital Circuits**, IIT Madras.

Fall, 2016: **EE5401: Measurements and Instrumentation**, IIT Madras.

Winter, 2016: **EE3006: Principles of Measurement**, IIT Madras.

Fellowships & Awards

2024 Selected as EECS Rising Stars, Massachusetts Institute of Technology 2024.

2023 Outperformed baseline in the ACM Multimedia 2023 Computational Paralinguistics Challenge (ComParE).

2023 Placed in top three in e-Prevention: Person Identification and Relapse Detection from Continuous Recordings of Biosignals Challenge in ICASSP'23.

2022 Travel grant of 1000 USD for MobiSys'22.

2022 All inclusive grant to attend Computing Research Association Widening Participation (CRA-WP), Grad Cohort Workshop for Women.

2021 Best research video award of 100 USD at Design Automation Conference Young Fellowship (DAC YF).

2021 Recipient of Design Automation Conference Young Fellowship (DAC YF).

2019 Spot Award at Analog Devices Inc.(ADI) acknowledging the contribution in scalable ethernet switch verification effort.

- Awarded to less than 1% ADI employees globally.

2019 Global finalists and site (Bangalore) winners of Blockchain Innovation Challenge at ADI.

2018 Best Paper in all tracks in IEEE Conference WinTechCon.

2017 Winner of Anveshan Design Challenge, Analog Devices Incorporation.

- National level competition organized by Analog Devices Inc. annually.

2015-2017 Awarded Research Assistantship fellowship by Govt. of India.

Services

Reviewing IMWUT'24, IROS'24, ICASSP'24, External Reviewer - ASP-DAC'24, EMSOFT'23, ICCPS'23, Cambridge University Press'23 (Why Does Math Work. . . If It's Not Real?), NSys'22

Journal Club NICO Reading Group, CPS Study Group

Mentoring

Current

Xiaoyuan Zhang (Masters, Northwestern University)

Shamika Likhite (Masters, Northwestern University)

Brooks Hu (Undergrad, Northwestern University)

Kiva Joseph (Undergrad, Northwestern University)

Past

Yueyuan Sui (Masters, Northwestern University)

Devashri Naik (Masters, Northwestern University)

Jinjin Cai (Masters, Northwestern University)

Shangke Liu (Masters, Northwestern University)

Yuqi Ma (Masters, Northwestern University)

Jonathan Li Chen, Ben Forbes, Justin Lau (Undergraduate students, Mechanical Engineering (Mentored for a course project on sensor data analysis for injury detecion), Northwestern University)

Interests

Races Redmond Harvest Half Marathon 2024, Chicago Half Marathon 2023.

Art Mixed Media, Oil on Canvas, Gouache Painting

Languages Odiya, Hindi, Bengali, Tamizh, English